COMMENTS AND RESPONSE

In view of the comments below, Applicants respectfully requests that the Examiner reconsider the present application including rejected claims, as amended, and withdraw the claim rejections.

Claim Objections

The Examiner has objected to claims 5, 6, 9-16, 20, and 24-30 for a number of informalities. By this response, Applicants have addressed these objections.

Regarding claim 5, Applicants have amended the term "a correlation" to read "the correlation."

Regarding claims 9 and 29, Applicants have amended the term "UWB" to read "incoming UWB".

Regarding the use in claim 9 of the term "the incoming" rather than "said incoming," Applicants submit that the term "the incoming" is a correct way of referring to a previously recited term. While the term "said incoming" would also be correct, there is no need for Applicants to change from one proper term to another.

Regarding claim 20, Applicants have amended the term "detecting" to read "detecting arms," have amended the term "a first" to read "the first," and have amended the term "a second" to read "the second."

Regarding claim 26, Applicants have amended the term "arm" to read "detecting arm".

Regarding claim 27, Applicants have amended the term "arm" to read "detecting arm" and have amended the term "a second" to read "the second".

These various amendments are made to correct informalities in the claims. They do not substantively change the scope of the claims and therefore should not serve to limit the application of the doctrine of equivalents with respect to these claims.

Based on these amendments, Applicants submit that the claims contain no informalities. Applicants therefore respectfully that the Examiner withdraw the objection to claims 5, 6, 9-16, 20, and 24-30 based on informalities.

Claim Rejections – 35 U.S.C. § 112, First Paragraph

The Examiner has rejected claims 9-16, 24, and 25 under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the enablement requirement. In particular, the Examiner has asserted that in claim 9 the term "configured to demodulate data from the incoming UWB signal" is not properly taught in the specification. Applicants respectfully traverse this rejection.

The Examiner notes that the system of claim 9 comprises a first correlator and a second correlator, and that each correlator is configured to correlate the incoming pulses with the local pulses to produce a correlation function, and configured to demodulate data from the incoming UWB signal. The Examiner then asserts that Applicants' specification and drawings do not support this feature. However, a careful examination of Applicants' specification and drawings will show adequate support for this feature.

With reference to Applicants' Fig. 1, their specification notes that "demodulation occurs in the waveform correlator 5 and the radio controller and interface 9 to recover the original data stream." (See, e.g., Applicants' specification, page 9, lines 13-15, and Fig. 1.) The specification then later notes that in some circumstances, "the output of the UWB waveform correlator 5 is the data itself," and that in other circumstances, "the UWB correlator 5 simply provides an

intermediate correlation result, which the radio controller and interface 9 uses to determine the data." (See, e.g., Applicants' specification, from page 12, line 28, through page 13, line 3, and Fig. 1.) The tracking correlators $31_{1\text{-}N}$ in Fig. 2 perform the same function as the UWB waveform correlator 5 in Fig. 1.

Thus, Applicants' specification discloses that in some circumstances the tracking correlators $31_{1\text{-}N}$ perform the function of demodulation.

As a result, this feature complies with the enablement requirement of 35 U.S.C. § 112, first paragraph. Applicants therefore respectfully request that the Examiner withdraw the rejection of claims 9-16, 24, and 25 under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the enablement requirement.

Claim Rejections – 35 U.S.C. § 112, Second Paragraph

The Examiner has rejected claims 8-20 and 22-25 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 8, the Examiner has asserted that the term "the predetermined threshold" lacks proper antecedent basis. By this response, Applicants have amended claim 8 to provide such antecedent basis. This amendment is made to correct formal matters and does not substantively change the scope of the claim. They should therefore not serve to limit the application of the doctrine of equivalents with respect to this claim.

Regarding claim 9, the Examiner has asserted that the term "configured to demodulate data from the incoming UWB signal" does not indicate clearly how the correlator is configured to demodulate data. Applicants traverse this assertion. As shown above, in some embodiments the

output of the correlator is the demodulated data, i.e., the correlation function also serves to demodulate the data. Thus, this element in the claim serves to very broadly recite demodulation, with one exemplary embodiment being that the correlation function also serves to demodulate the data. This makes the cited recitation in claim 9 broad, not indefinite.

Regarding claims 15 and 24, the Examiner asserts that "a first detecting arm" and "a second detecting arm" do not clearly indicate what are the relations or connections to "a first correlator" and "a second correlator." By this response, Applicants have amended claims 15 and 24 to better recite this feature. In particular, Applicants have amended claims 15 and 24 to recite that "the first correlator is in a first detecting arm," and that "the second correlator is in a second detecting arm."

Regarding claim 17, the Examiner has asserted that the term "the first and second detecting arms" lack proper antecedent basis. By this response, Applicants have amended claim 17 to provide proper antecedent basis. This amendment is made to correct formal matters and does not substantively change the scope of the claim. It should therefore not serve to limit the application of the doctrine of equivalents with respect to this claim.

Regarding claim 18, the Examiner states that the "predetermined threshold" recited in lines 13 and 14 does not clearly indicate which predetermined threshold this refers to. Although Applicants assert that this is perfectly clear as recited, they have amended claim 18 to recite "finding a second correlation value for a second detecting arm that exceeds the predetermined threshold, after decreasing the predetermined threshold."

Regarding claims 18, 20, and 22, the Examiner has asserted that the term "the detecting arm" lacks proper antecedent basis. By this response, Applicants have amended claim 18, 20, and 22 to better recite the detecting arms in a manner that provides proper antecedent basis. These amendments are made to correct formal matters and do not substantively change the scope of the

claims. They should therefore not serve to limit the application of the doctrine of equivalents with respect to these claims.

Regarding claim 22, the Examiner has asserted that "a first detecting arm" and "a second detecting arm" do not clearly indicate what are the relations or connections to "a correlator." By this response Applicants have amended claim 22 to recite "a correlator configured to correlate the incoming pulses with the local pulses to produce at least two correlation functions," "a first correlation value selected from the at least two correlation functions for a first detecting arm," "a second correlation value selected from the at least two correlation functions for a second detecting arm," and "a comparator configured to compare the first correlation value to the second correlation value to select the first detecting arm when the first correlation value is greater than the second correlation value, and to select the second detecting arm when the second correlation value is greater than the first correlation value." This clearly indicates how the correlator and the detecting arms are related.

Thus, for at least the reasons given above, claims 8-20 and 22-25 are fully definite. Applicants therefore respectfully request that the Examiner withdraw the rejection of claims 8-20 and 22-25 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim Rejections 35 USC § 102

The Examiner has rejected claims 1-4, 9-12, 17, and 29 under 35 U.S.C. § 102(e) as being allegedly unpatentable over United States Patent No. 6,128,331 to Struhsaker et al. ("Struhsaker"). Applicants respectfully traverse this rejection.

Claim 1 recites "generating first local pulses at a first detecting arm in the UWB receiver," "generating second local pulses at a second detecting arm in the UWB receiver," and "correlating the first and second local pulses with the incoming pulses to produce a first and second correlation functions, respectively." This makes it clear that the incoming pulses of the UWB signal are correlated with locally generated pulses.

The Examiner has asserted that the reference PN (REF PN) signal generated by the PN generator 36 shows the recited first local pulses, one of the phase-shifted PN signals (PN_1-PN_X) generated by the PN generator 36 shows the recited second local pulses, the correlation circuit 18 and the correlation circuit 20 show the recited correlating of the first and second local pulses with the incoming pulses. However, a careful examination of Struhsaker shows that this is not the case.

First, the PN generator 36 does not generate first or second pulses, as defined in Applicants' specification. The PN generator 36 generates a digital PN sequence. (See, e.g., Struhsaker, column 3, lines 15-30, which describes how 2's complement addition circuitry is used on the PN sequence.) This digital PN sequence is not a series of local pulses, which are clearly analog signals, as described in the specification, pulses are analog signal portions. (See, e.g., Applicants' specification from page 8, line 1, through page 15, line 6, and Figs. 1a and 1b.)

Second, neither the correlation circuit 18 nor the correlation circuit 20 operate to correlate first and second local pulses with incoming pulses from a UWB signal. Struhsaker does not disclose the use of UWB signals. Even if it did show the use of UWB signals, it does not show correlating incoming pulses of a UWB signal with locally-generated pulses.

As shown above, the various PN sequences are digital values and are not pulses as defined by Applicants' specification. But even if they were, the RF down converter 12 in Struhsaker receives an RF signal and provides an in-phase (I) and a quadrature (Q) signal therefrom. These

analog I and Q signals are respectively passed to analog to digital converters 14, 16 which, in standard fashion, present multiple bit digitized output signals, which correspond to the instantaneously received analog signals. It is these digitized I and Q signals that are passed to the correlation circuits 18, 20. (See, e.g., Struhsaker, column 3, lines 1-9, and drawing.) And the digitized I and Q signals are further passed through a precision conversion circuit 26 operative to convert the I and Q signals to a format suitable for receipt and operation by the low precision correlation circuit 20. (See, e.g., Struhsaker, column 3, lines 31-36, and drawing.)

The correlation circuit 18 provides a high precision correlation function of the digitized I and Q signals for data demodulation. (See, e.g., Struhsaker, column 3, lines 9-11, and drawing.) But correlating digitized I and Q signals that correspond to an analog signal are not the same as correlating incoming pulses of an analog signal, and cannot anticipate such a recited feature. The digitized I and Q signals are not pulses in an incoming signal. They are two separate digital signals generated based on an incoming signal.

Similarly, the correlation circuit 20 performs a 1 or 2 bit correlation on the digitized, converted I and Q signals against a phase shifted PN code. (See, e.g., Struhsaker, column 3, lines 38-42, and drawing.) But as above, correlating digitized, converted I and Q signals that correspond to an analog signal are not the same as correlating incoming pulses of an analog signal, and cannot anticipate such a recited feature. The digitized I and Q signals are not pulses in an incoming signal. They are two separate digital signals generated based on an incoming signal.

In addition, Struhsaker does not disclose "selecting one of the first and second detecting arms to identify the phase based on the first and second correlation functions and to demodulate data from the incoming UWB signal," as recited in claim 1. The output of the correlator 18 is used

as the data signal in every case. No selection function is performed based on the output of the correlators 18 and 20. In fact, no selection is performed at all.

Claims 2-4 depend from claim 1 and are allowable for at least the reasons given above for claim 1.

In addition, claim 3 recites that "the incoming pulses are at least one of bi-phase modulated, and quadrature phase modulated." Nothing in Struhsaker discloses this feature.

The Examiner has asserted that the use of I/Q symbols and a quadrature demodulator 24 discloses the use of bi-phase modulated or quadrature phase modulated pulses. But this is not the case. The use of I/Q symbols and a quadrature demodulator 24 allows the device to demodulate an arbitrary waveform having any of a wide variety of constellations. But nothing in Struhsaker discloses the particular use of bi-phase modulated or quadrature phase modulated pulses. And absent such a specific disclosure, Struhsaker cannot anticipate that feature, as recited in claim 3.

In addition, claim 4 recites that "the incoming pulses are multilevel pulses." Nothing in Struhsaker discloses this feature.

The Examiner has asserted that Struhsaker's teaching that the invention relates to a correlation system adapted for use with portable battery operated commuting and communication systems which typically employ burst transmissions such as radio packet data networks and wireless LANs discloses that the incoming pulses are multilevel pulses. But this is not the case. The fact that a system uses burst transmissions such as those in radio packet data networks and wireless LANs discloses nothing about whether the incoming pulses are multilevel. And absent such a specific disclosure, Struhsaker cannot anticipate that feature, as recited in claim 4.

Claim 9 recites "an antenna configured to receive incoming pulses of the incoming UWB signal, adjacent pulses of said incoming pulses occurring at a predetermined interval." Struhsaker

does not disclose an antenna, nor does it disclose receiving a UWB signal. As a result, it cannot anticipate claim 9, which recites these features.

Claim 9 also recites "a first signal generator configured to generate first local pulses," and "a second signal generator configured to generate second local pulses." Struhsaker does not disclose these features for reasons analogous to those shown above with respect to claim 1.

As noted above, the PN generator 36 does not generate pulses as defined in the specification. Thus, the PN generator 36 of Struhsaker cannot be used to anticipate the recited first and second signal generators.

Claim 9 also recites "a first correlator configured to correlate the incoming pulses with the first local pulses to produce a first correlation function, and configured to demodulate data from the incoming UWB signal," and "a second correlator configured to correlate the incoming pulses with the second local pulses to produce a second correlation function, and configured to demodulate data from the incoming UWB signal." Struhsaker does not disclose these features for reasons analogous to those shown above with respect to claim 1.

As noted above, neither of the correlation circuits 18 and 20 operate on incoming pulses of a UWB signal. Instead they operate on digitized I and Q signals.

Claim 9 also recites "a selector configured to select one of the first and second correlators to identify the phase based on the first and second correlation functions and to demodulate data from the incoming UWB signal, and to select another of the first and second correlators to perform a phase refining function." Struhsaker does not disclose this feature for reasons analogous to those shown above with respect to claim 1.

As noted above, nothing in Struhsaker discloses any element that performs a selection function on the correlation circuits 18, 20 to select one to identify phase. The correlation circuit 18 always outputs the data signal in every case. As a result, nothing is ever selected.

Claims 10-12 depend from claim 9 and are allowable for at least the reasons given above for claim 9.

In addition, claim 11 recites that "the incoming pulses are at least one of bi-phase modulated, and quadrature phase modulated." Nothing in Struhsaker discloses this feature for the reasons given above with respect to claim 3.

In addition, claim 12 recites that "the incoming pulses are multilevel pulses." Nothing in Struhsaker discloses this feature for the reasons given above with respect to claim 4.

The Examiner has asserted that Struhsaker's teaching that the invention relates to a correlation system adapted for use with portable battery operated commuting and communication systems which typically employ burst transmissions such as radio packet data networks and wireless LANs discloses that the incoming pulses are multilevel pulses. But this is not the case. The fact that a system uses burst transmissions such as those in radio packet data networks and wireless LANs discloses nothing about whether the incoming pulses are multilevel. And absent such a specific disclosure, Struhsaker cannot anticipate what is recited in claim 4.

Claim 17 recites "means for receiving incoming pulses of the incoming UWB signal, adjacent pulses of said incoming pulses arriving at a predetermined interval." Struhsaker does not disclose this feature for reasons analogous to those shown above with respect to claim 1.

As noted above, Struhsaker does not disclose receiving a UWB signal.

Claim 17 also recites "means for generating first local pulses at the UWB receiver," and "means for generating second local pulses at the UWB receiver." Struhsaker does not disclose this feature for reasons analogous to those shown above with respect to claim 1.

As noted above, the PN generator 36 does not generate pulses as defined in the specification. Thus, the PN generator 36 of Struhsaker cannot be used to anticipate the recited first and second signal generators.

Claim 17 also recites "means for correlating the first local pulses with the incoming pulses to produce a first correlation function, and for demodulating data from the incoming UWB signal," and "means for correlating the second local pulses with the incoming pulses to produce a second correlation function, and for demodulating the data from the incoming UWB signal." Struhsaker does not disclose this feature for reasons analogous to those shown above with respect to claim 1.

As noted above, neither of the correlation circuits 18 and 20 operate on incoming pulses of a UWB signal. Instead they operate on digitized I and Q signals.

Claim 17 also recites "means for selecting one of first and second detecting arms to identify the phase and demodulate the data from the incoming UWB signal based on the first and second correlation functions, and for selecting another of the first and second detecting arms to continue to produce either a first or second correlation function." Struhsaker does not disclose this feature for reasons analogous to those shown above with respect to claim 1.

As noted above, nothing in Struhsaker discloses any element that performs a selection function on the correlation circuits 18, 20 to select one to identify phase. The correlation circuit 18 always outputs the data signal in every case. As a result, nothing is ever selected.

Claim 29 recites "an antenna configured to receive incoming pulses of the incoming UWB signal." Struhsaker does not disclose this feature for reasons analogous to those shown above with respect to claim 9.

As noted above, Struhsaker does not disclose an antenna, nor does it disclose receiving a UWB signal.

Claim 29 also recites "a first detecting arm including: a first signal generator configured to generate first local pulses," and "a second detecting arm including: a second signal generator configured to generate second local pulses." Struhsaker does not disclose this feature for reasons analogous to those shown above with respect to claim 1.

As noted above, the PN generator 36 does not generate pulses as defined in the specification. Thus, the PN generator 36 of Struhsaker cannot be used to anticipate the recited first and second signal generators.

Claim 29 also recites "a first detecting arm including ... a first tracking correlator configured to correlate the incoming pulses with the first local pulses to produce a first correlation function, and configured to demodulate data from the incoming UWB signal," and "a second detecting arm including ... a second tracing correlator configured to correlate the incoming pulses with the second local pulses to produce a second correlation function, and configured to demodulate the data from the incoming UWB signal." Struhsaker does not disclose this feature for reasons analogous to those shown above with respect to claim 1.

As noted above, neither of the correlation circuits 18 and 20 operate on incoming pulses of a UWB signal. Instead they operate on digitized I and Q signals.

Claim 29 also recites "a selector configured to select one of the first and second detecting arms to identify a phase of the incoming UWB signal based on the first and second correlation

functions and to demodulate the data from the incoming UWB signal, and configured to select another of the first and second detecting arms to continue to produce either a first or second correlation function." Struhsaker does not disclose this feature for reasons analogous to those shown above with respect to claim 1.

As noted above, nothing in Struhsaker discloses any element that performs a selection function on the correlation circuits 18, 20 to select one to identify phase. The correlation circuit 18 always outputs the data signal in every case. As a result, nothing is ever selected.

Therefore, for at least the reasons given above, Applicants respectfully request that the Examiner withdraw the rejection of claims 1-4, 9-12, 17, and 29 under 35 U.S.C. § 102(e) as being allegedly unpatentable over Struhsaker.

Claim Rejections 35 USC § 103

The Examiner has rejected claims 13 and 14 under 35 U.S.C. § 103(a) as being allegedly unpatentable over Struhsaker in view of United States Patent No. 5,768,306 to Sawahashi et al. ("Sawahashi"). Applicants respectfully traverse this rejection.

Claims 13 and 14 depend from claim 9 and area allowable for at least the reasons given above for claim 9. What Struhsaker does not disclose, a combination of Struhsaker and Sawahashi does not suggest.

Therefore, based on at least the reasons given above, Applicants respectfully request that the Examiner withdraw the rejection of 13 and 14 under 35 U.S.C. § 103(a) as being allegedly unpatentable over Struhsaker in view of Sawahashi.

Allowed Claims

The Examiner has indicated that claims 5, 6, 26-28, and 30 would be allowable if rewritten to overcome the claim objections identified above. Based on the amendments and remarks in this response, Applicants submit that these claim objections have been fully addressed, leaving claims 5, 6, 26-28, and 30 in a condition the Examiner has indicated is allowable.

The Examiner has indicated that claims 18, 19, 22, and 23 would be allowable if rewritten to overcome the rejections under 35. U.S.C. § 112, second paragraph, set forth in the current Office Action. For the reasons given above, Applicants submit that the rejections of these claims under 35. U.S.C. § 112, second paragraph, have been fully addressed. This places claims 18, 19, 22, and 23 in a condition the Examiner has indicated is allowable.

The Examiner has indicated that claims 8, 19, and 20 would be allowable if rewritten to overcome the rejections under 35. U.S.C. § 112, second paragraph, set forth in the current Office Action, and to include all of the limitations of the base claim and any intervening claims. For the reasons given above, Applicants submit that the rejections of these claims under 35. U.S.C. § 112, second paragraph, have been fully addressed.

In addition, claims 8 and 20 depend from claim 1, which is allowable for the reasons given above; and claim 19 depends from claim 18, which is allowable for the reasons given above.

This places claims 8, 19, and 20 in a condition the Examiner has indicated is allowable.

Conclusion

Accordingly, Applicants respectfully submit that the claims, as amended, clearly and patentably distinguish over the cited references of record and as such are deemed allowable. Such

allowance is hereby earnestly and respectfully solicited at an early date. If the Examiner has any suggestions, comments, or questions, calls are welcome at the telephone number below.

Although it is not anticipated that any additional fees are due or payable, the Commissioner is hereby authorized to charge any fees that may be required to Deposit Account No. 50-1147.

Respectfully Submitted,

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